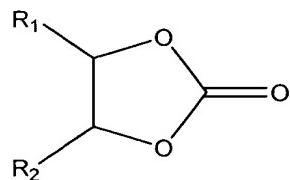


1 WHAT IS CLAIMED IS:

2 1. A process for preparing Group II metal carbonated, overbased Mannich
3 condensation products of alkylphenols which comprises:

4 forming a reaction mixture by combining a Mannich condensation
5 product of an alkylphenol wherein the alkyl group contains a sufficient
6 number of carbon atoms to render oil-soluble the resulting Group II
7 metal carbonated, overbased Mannich condensation products of
8 alkylphenol, a Group II metal oxide, hydroxide or C₁-C₆ alkoxide, one or
9 more promoters, and an alkylene carbonate selected from ethylene
10 carbonate or a mono-alkyl or di-alkyl substituted ethylene carbonate,
11 said alkylene carbonate having the following structure:



13 wherein R₁ and R₂ are independently hydrogen or alkyl containing one to
14 three carbon atoms; and wherein the combining is carried out for a time
15 and at a temperature sufficient to form in situ carbon dioxide and
16 alkylene glycol, or a reacting equivalent, to form a product comprising a
17 Group II metal carbonated, overbased Mannich condensation product of
18 an alkylphenol.

19 2. A process for preparing Group II metal carbonated, overbased Mannich
20 condensation products of alkylphenols which comprises:

21 forming a reaction mixture by combining a Mannich condensation
22 product of an alkylphenol wherein the alkyl group contains a sufficient
23 number of carbon atoms to render oil-soluble the resulting Group II
24 metal carbonated, overbased Mannich condensation products of

1 alkylphenol, a Group II metal oxide, hydroxide or C₁-C₆ alkoxide, one or
2 more promoters, and a C₂-C₁₀ alkylene glycol and carbon dioxide and
3 wherein the combining is carried out for a time and at a temperature
4 sufficient to form a product comprising a Group II metal carbonated,
5 overbased Mannich condensation product of an alkylphenol.

6 3. The process of claim 2 wherein the C₂-C₁₀ alkylene glycol is ethylene
7 glycol.

8 4. The process of claim 1 wherein the Mannich condensation product of an
9 alkylphenol is a Group II metal salt.

10 5. The process of claim 2 wherein the Mannich condensation product of an
11 alkylphenol is a Group II metal salt.

12 6. The process of claim 1 wherein the alkylene carbonate is added to the
13 reaction mixture over a time period of about 15 minutes to about
14 120 minutes.

15 7. The process of claim 6 wherein the alkylene carbonate is added to the
16 reaction mixture over a time period of about 30 minutes to about
17 90 minutes.

18 8. The process of claim 1 wherein one of R₁ and R₂ is hydrogen and the
19 other is hydrogen or methyl.

20 9. The process of claim 1 wherein the alkylene carbonate is ethylene
21 carbonate.

22 10. The process of claim 1 wherein the promoter comprises a C₂-C₁₀
23 alkylene glycol.

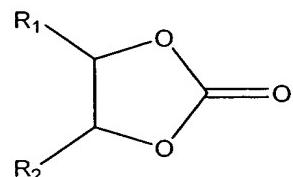
1 11. The process of claim 1 wherein a second promoter comprises water, a
2 C₁-C₅ mono- or di-alcohol, ethylene glycol or a mixture thereof.

3 12. The process of claim 1 further comprises recovering the product by
4 filtering the reaction mixture to remove sediment.

5 13. A process for preparing Group II metal carbonated, overbased Mannich
6 condensation products of alkylphenols which comprises the steps of:

7 (a) forming a reaction mixture by combining a Mannich condensation
8 product of an alkylphenol wherein the alkyl group contains a
9 sufficient number of carbon atoms to render oil-soluble the
10 resulting Group II metal overbased Mannich alkylphenol, and one
11 or more promoters, and a Group II metal oxide, hydroxide or C₁-C₆
12 alkoxide; and

13 (b) contacting said reaction mixture with an alkylene carbonate
14 selected from ethylene carbonate or a mono-alkyl or di-alkyl
15 substituted ethylene carbonate, said alkylene carbonate having the
16 following structure:

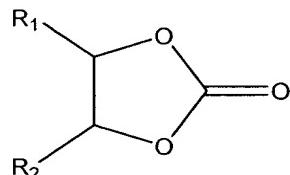


17

18 wherein R₁ and R₂ are independently hydrogen or alkyl containing
19 one to three carbon atoms; and wherein the contacting is carried
20 out for a time and at a temperature sufficient to form in situ carbon
21 dioxide and alkylene glycol, or a reacting equivalent, to form a
22 product comprising a Group II metal carbonated-overbased
23 Mannich condensation product of an alkylphenol.

- 1 14. The process of claim 13 wherein the Mannich condensation product of
- 2 an alkylphenol is a Group II metal salt.
- 3 15. The process of claim 13 wherein in step (b) the alkylene carbonate is
- 4 added to the reaction mixture over a time period of about 15 minutes to
- 5 about 120 minutes.
- 6 16. The process of claim 15 wherein in step (b) the alkylene carbonate is
- 7 added to the reaction mixture over a time period of about 30 minutes to
- 8 about 90 minutes.
- 9 17. The process of claim 13 wherein in step (b) one of R₁ and R₂ is
- 10 hydrogen and the other is hydrogen or methyl.
- 11 18. The process of claim 13 wherein in step (b) the alkylene carbonate is
- 12 ethylene carbonate.
- 13 19. The process of claim 13 wherein in step (a) the promoter is a C₂-C₁₀
- 14 alkylene glycol.
- 15 20. The process of claim 13 wherein in step (b) the second promoter
- 16 comprises water, a C₁-C₅ mono- or di-alcohol, ethylene glycol or a
- 17 mixture thereof.
- 18 21. The process of claim 13 further comprising:
- 19 (c) recovering the product by filtering the reaction mixture of step (b) to
- 20 remove sediment.
- 21 22. A process for preparing Group II metal carbonated, overbased Mannich
- 22 condensation products of alkylphenols which comprises the steps of:

- 1 (a) forming a first reaction mixture by combining an alkylphenol
2 wherein the alkyl group contains a sufficient number of carbon
3 atoms to render oil-soluble the resulting Group II metal carbonated,
4 overbased Mannich condensation products of alkylphenol with an
5 aldehyde and an amine, in the presence of an inert hydrocarbon
6 diluent;
- 7 (b) contacting said first reaction mixture with a second reaction mixture
8 comprising a Group II metal oxide, hydroxide or C₁-C₆ alkoxide,
9 and a promoter to form a third reaction mixture; and
- 10 (c) contacting said third reaction mixture with an alkylene carbonate
11 selected from ethylene carbonate or a mono-alkyl or di-alkyl
12 substituted ethylene carbonate, said alkylene carbonate having the
13 following structure:



14 wherein R₁ and R₂ are independently hydrogen or alkyl containing
15 one to three carbon atoms; and wherein said contacting is carried
16 out for a time and at a temperature sufficient to form in situ carbon
17 dioxide and alkylene glycol, or a reacting equivalent, to form a
18 product comprising a Group II metal carbonated, overbased
19 Mannich condensation product of an alkylphenol.

- 21 23. The process of claim 22 wherein in step (c) the alkylene carbonate is
22 added to the third reaction mixture over a time period of about
23 15 minutes to about 120 minutes.

- 1 33. The process of claim 32 wherein the aliphatic aldehyde is formaldehyde
- 2 or paraformaldehyde.
- 3 34. The process of claim 33 wherein the aromatic aldehyde is
- 4 benzaldehyde.
- 5 35. The process of claim 33 wherein the heterocyclic aldehyde is furfural.
- 6 36. The process of claim 22 wherein the molar ratios of the alkylphenol, the
- 7 aldehyde and the amine are from about 1:1.8:1 to about 1:3:1.
- 8 37. The process of claim 22 further comprising:
 - 9 (d) recovering the product by filtering the third reaction mixture of
 - 10 step (c) to remove sediment.
- 11 38. The process of claim 22 wherein the alkyl group of the alkylphenol is a
- 12 straight-chain alkyl group or branched-chain alkyl group containing at
- 13 least 10 carbon atoms.
- 14 39. The process of claim 38 wherein the straight-chain alkyl group or the
- 15 branched-chain alkyl group contains from about 12 carbon atoms to
- 16 about 50 carbon atoms.
- 17 40. The process of claim 38 wherein the alkyl group of the alkylphenol
- 18 contains from about 25 to about 100 mole percent predominantly
- 19 straight-chain alkyl groups containing from about 15 to about 35 carbon
- 20 atoms and from about 75 to about 0 mole percent branched-chain alkyl
- 21 groups containing from about 9 to about 18 carbon atoms.
- 22 41. The process of claim 40 wherein the alkyl group of the alkylphenol
- 23 contains from about 40 to about 70 mole percent predominantly
- 24 straight-chain alkyl groups containing from about 15 to about 35 carbon

1 atoms and from about 60 to about 30 mole percent branched-chain alkyl
2 groups containing from about 9 to about 18 carbon atoms.

3 42. The process of claim 22 wherein the alkyl group of the alkylphenol is
4 attached predominantly at the para position of the phenol ring.

5 43. The process of claim 42 wherein the alkylphenol containing the para
6 attachment of the alkyl group is from about 70 to about 95 weight
7 percent of the total alkylphenol.

8 44. The process of claim 22 wherein the Group II metal oxide, hydroxide or
9 C₁-C₆ alkoxide is selected from the group consisting of calcium, barium,
10 and magnesium oxide, hydroxide or C₁-C₆ alkoxide and mixtures
11 thereof.

12 45. The process of claim 44 wherein the Group II metal oxide, hydroxide or
13 C₁-C₆ alkoxide is calcium hydroxide.

14 46. A product made by the process of claim 1 wherein the CO₂ to Ca ratio of
15 the product is in the range of about 0.01 to about 0.6.

16 47. A product made by the process of claim 13 wherein the CO₂ to Ca ratio
17 of the product is in the range of about 0.01 to about 0.6.

18 48. A product made by the process of claim 22 wherein the CO₂ to Ca ratio
19 of the product is in the range of about 0.01 to about 0.6.

20 49. A detergent-dispersant antioxidant additive comprising a Group II metal
21 carbonated, overbased Mannich condensation products of alkylphenols,
22 said product additive having a CO₂ to Ca ratio in the range of about 0.01
23 to about 0.6.

- 1 50. The detergent-dispersant antioxidant additive of claim 49 having a CO₂
2 to Ca ratio in the range of about 0.3 to about 0.5.
- 3 51. A detergent-dispersant antioxidant additive comprising a Group II metal
4 carbonated, overbased Mannich condensation products of alkylphenols
5 wherein the Mannich condensation products of alkylphenol is a
6 condensation product of an alkylphenol, an aldehyde and an aliphatic
7 amine, an aromatic amine, a polyfunctional amine or mixtures thereof,
8 said additive having a CO₂ to Ca ratio is in the range of about 0.01 to
9 about 0.6.
- 10 52. The detergent-dispersant antioxidant additive of claim 51 wherein said
11 product additive has a CO₂ to Ca ratio in the range of about 0.3 to about
12 0.5.
- 13 53. A Mannich condensation product comprising a reaction product of an
14 alkylphenol, an aldehyde and N-phenyl-1,4-phenylene diamine.
- 15 54. The product of claim 53 wherein the alkyl group of the alkylphenol is a
16 straight-chain alkyl group or branched-chain alkyl group containing from
17 about 10 carbon atoms to about 50 carbon atoms.
- 18 55. The product of claim 54 wherein the alkyl group of the alkylphenol has
19 about 12 carbon atoms to about 24 carbon atoms.
- 20 56. The product of claim 53 wherein the aldehyde is an aliphatic aldehyde,
21 aromatic aldehyde, a heterocyclic aldehyde or mixtures thereof.
- 22 57. The product of claim 56 wherein the aliphatic aldehyde is
23 paraformaldehyde or formaldehyde.

- 1 58. The product of claim 53 wherein the alkyl group of the alkylphenol has
2 about 12 carbon atoms, the aldehyde is paraformaldehyde, and the
3 amine is N-phenyl-1,4-phenylene diamine.